Section A [45 MARKS] Ans

Answer all the questions in the space provided.

1 **(a)** (i) 0.26 Kg

(ii) 260g

(b) Using d=m/v

0.80 = m/ 250

m = 200g

(c) Mass of beaker= 260 – 200 = 60g

2 **(a)** Infra red radiation

(b) Microwave

(c) Gamma rays

3 **(a)** During condensation, the average speed of the molecules decreases

(b) As it slows down in the movement, the molecules move closer to each other and hence the intermolecular distance is reduced.

4 Scale : 1 cm represents 2.67 N (extend to 6 cm; 6 cm = 16 N)

Resultant force = 6.3 cm x 2.67 =16.8 N

5 **(a)** n = sin 20/ sin 14

= 1.41

Therefore, n= sin 40/sin r

1.41 = sin 40/sin r

r = 27.1^{o}

(b) n = 1/sin C

1.41 = 1/sin C

C = 45.2^{o}

(c) No. For Total internal reflection to take place, light must travel from a medium of higher optical density to that of a low optical density.

6 **(a)**

(b) K.E. = 0.5 mv^2

= 0.5 x 300 x 40^2

= 240 000 J

(c) Braking force = ma

= 300 x [(40-0)/8]

= 1500 N

Or use energy conversion:

K.E. lost = Work done to overcome friction

240000 = F x (area under graph from 20 to 28s)

F = 1500 N

7 **(a)** Using principle of moments,

CW moments = ACW moments

F x 0.1 = 300 x 0.7

F = 2100 N

(b) At higher steam pressure, increase the mass of the movable weight balance the increase in moment due to a higher force at valve.

Alternatively, the weight can be moved further away to increase the moment of the weight to balance the moment due to a higher force at the valve.

8 **(a)** V = fλ

Λ = 320/ 400 = 0.8 m

(b) The speed of the wave increases in water. Since wavelength of the sound wave is proportional to speed, the wavelength increases.

9 **(a)** Since like charges repel and the droplets are positively charged, they will spread out.

(b) Since the paint droplets are positively charged and unlike charges attract, they will be attracted to the negatively charged plate, ensuring an even distribution of paint.

10 **(a)** Q = It

= 3 x 1s

= 3 C

(b) Combined resistance:

1/R = 1/3 + 1/ 6

R = 2Ω

Total R = 2 + 2 = 4 Ω

11 **(a)** Force if downwards (use left hand rule)

(b) (i) When no of cells is reduced, current decreases, therefore force is reduced.

(ii) When terminals are reversed, the direction of current changes, therefore forward is now upwards.

Section B

12 **(a)** W.D. = F x s

= 50 000 x 12 m

= 600 000 J

(b) Using principle of moments,

50 000 x 15 = C x 10

C = 75 000N

Therefore, mass = 75 000/10 = 7 500 kg

(c) As the weight is at the pivot, the distance of the force is zero, therefore the moment of the weight is zero and not taken into consideration.

(d) Using principle of moments,

50 000 x 9 = 75 000 x d

d = 6 m

therefore C has to move (10 -6) 4 m towards the pivot.

(e) It is more stable in fig (ii) as there is a lower center of gravity.

(f) Increase the base area by adding more supports or lower the c.g. by increase the weight at the base.

13 **(a)** (i) V= IR

R_A = V/I

= 2/ 16 = 0.125 Ω

(ii) B has a smaller cross sectional area as the resistance (based on gradient) is higher.

(b) (i) P.d. across AB = IR

= 10 x 10^{-3} (milli) x 100 x 10^{3} (kilo)

= 1000 V

(ii) V= IR

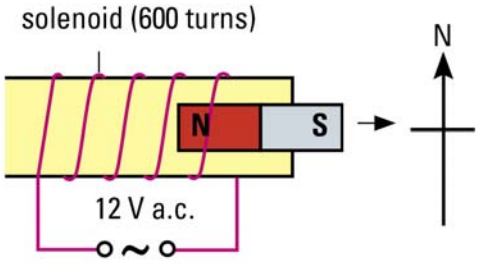
$1000 = 40 \times 10^{-3}$ (milli) x R

R = 25 000Ω

14 **(a)** (i) for A and C arrows to the left, B arrow to the right. (use right hand rule)

(ii) When the current is switched on, the iron rods are magnetized with like poles at the ends of the rods. Since like poles repel, the rods will move way from each other.

(iii) To demagnetize a magnet, place the magnet in a solenoid connected to a.c. supply. Draw the magnet out in the east west direction and the magnet will be demagnetized.



(b) In the circuit breaker, when there is an excess current flowing through it, the electromagnet becomes strong enough to attract the soft iron armature. This will break the contact in the circuit and stop any more flow of current in the circuit. The iron armature will then be released from attraction as it is no longer magnetised. To close the circuit, the reset button is pressed to place the soft iron back in contact.